I ENT COOPERATION TRE. Y

From the INTERNATIONAL BUREAU

# PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

| Date of mailing (day/month/year) | |
|---|---|
| 14 November 2001 (14.11.01) | |
| **International application No.** PCT/US00/26394 | **Applicant's or agent's file reference** 2092.PCT1 |
| **International filing date** (day/month/year) 26 September 2000 (26.09.00) | **Priority date** (day/month/year) 18 October 1999 (18.10.99) |
| **Applicant** FRENCH, William, W. | |

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

09 May 2001 (09.05.01)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

**The International Bureau of WIPO**
**34, chemin des Colombettes**
**1211 Geneva 20, Switzerland**

Facsimile No.: (41-22) 740.14.35

Authorized officer

Antonia MULLER

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY



# PCT

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

**(PCT Article 36 and Rule 70)**

| Applicant's or agent's file reference 2092.PCT1 | **FOR FURTHER ACTION** | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
|---|---|---|
| International application No. PCT/US00/26394 | International filing date *(day/month/year)* 26 SEPTEMBER 2000 | Priority date *(day/month/year)* 18 OCTOBER 1999 |
| International Patent Classification (IPC) or national classification and IPC Please See Supplemental Sheet. | | |
| Applicant FRENCH, WILLIAM W. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 0 sheets.

3. This report contains indications relating to the following items:

- I [X] Basis of the report
- II [ ] Priority
- III [ ] Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV [ ] Lack of unity of invention
- V [X] Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI [ ] Certain documents cited
- VII [X] Certain defects in the international application
- VIII [ ] Certain observations on the international application

| Date of submission of the demand | Date of completion of this report |
|---|---|
| 09 MAY 2001 | 08 JULY 2001 |
| Name and mailing address of the IPEA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231 | Authorized officer Sharon S. Hoppe<br>RAMON BARRERA |
| Facsimile No. (703) 305-3230 | Telephone No. (703) 308-1782 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/26394

## I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-20 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the claims:
pages 21-28 , as originally filed
pages NONE , as amended (together with any statement) under Article 19
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the drawings:
pages 1-7 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the sequence listing part of the description:
pages NONE , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the writen sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NONE

☒ the claims, Nos. NONE

☒ the drawings, sheets/~~fig~~ NONE

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

***Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/26394

**V. Reasoned statement under Article 35(2) with regard to n velty, inventive step r industrial applicability; citations and explanati ns supp rting such statement**

1. statement

| | | | |
|---|---|---|---|
| Novelty (N) | Claims | 1-34 | YES |
| | Claims | NONE | NO |
| Inventive Step (IS) | Claims | 1-34 | YES |
| | Claims | NONE | NO |
| Industrial Applicability (IA) | Claims | 1-34 | YES |
| | Claims | NONE | NO |

2. citations and explanations (Rule 70.7)

Claims 1-34 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a self powered, mobile, substantially stationary structure which comprises a spinning body substantially enclosing a self-contained drive mechanism powered by energy derived from electromagnetic radiations, and biased by the direction of an ambient field of energy. JP10171383A, the closest prior art of record, fails to disclose biasing by the direction of an ambient field of energy.

NEW CITATIONS

NONE

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/26394

## VII. Certain defects in the internati nal applicati n

**The following defects in the form or contents of the international application have been noted:**

Claim 2 is objected to under PCT Rule 66.2(a)(iii) as containing the following defect(s) in the form or contents thereof: "enclosures" on line 10 should be "enclosure".

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US00/26394

**Supplemental B x**
(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII



CLASSIFICATION:

The International Patent Classification (IPC) and/or the National classification are as listed below:
IPC(7): G09B 27/08; G09F 19/02 and US Cl.: 335/285; 310/90.5; 361/144; 40/426; 446/129; 318/135

PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| Applicant's or agent's file reference | **FOR FURTHER ACTION** see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. | |
|---|---|---|
| International application No. | International filing date *(day/month/year)* | (Earliest) Priority Date *(day/month/year)* |
| PCT/US 00/ 26394 | 26/09/2000 | 18/10/1999 |
| Applicant | | |
| FRENCH, WILLIAM W. | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language,** the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

[ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

[ ] contained in the international application in written form.

[ ] filed together with the international application in computer readable form.

[ ] furnished subsequently to this Authority in written form.

[ ] furnished subsequently to this Authority in computer readble form.

[ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

[ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

[ ] the text is approved as submitted by the applicant.

[X] the text has been established by this Authority to read as follows:

SELF ROTATING DISPLAY SPERICAL DEVICE

5. With regard to the **abstract,**

[ ] the text is approved as submitted by the applicant.

[X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 1

[X] as suggested by the applicant.

[ ] None of the figures.

[ ] because the applicant failed to suggest a figure.

[ ] because this figure better characterizes the invention.

**Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)**

LINE 12: DELETE "(20)"
LINE 13: DELETE "(19)"
LINE 13: DELETE "(12)"
LINE 14: DELETE "(8)"
LINE 17: DELETE AFTER "MAGNETIC FIELD." "THE"
DELETE LINES 18,19 AND 20

# INTERNATIONAL SEARCH REPORT

International Application No
[redacted]T/US 00/26394

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G09B27/08 G09F19/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G09B G09F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | PATENT ABSTRACTS OF JAPAN<br>vol. 014, no. 516 (P-1130),<br>13 November 1990 (1990-11-13)<br>& JP 02 214886 A (EIJI HONDA),<br>27 August 1990 (1990-08-27)<br>abstract<br>--- | 1-5,<br>11-14 |
| Y | PATENT ABSTRACTS OF JAPAN<br>vol. 1998, no. 11,<br>30 September 1998 (1998-09-30)<br>& JP 10 171383 A (HIROSE MAMORU),<br>26 June 1998 (1998-06-26)<br>cited in the application<br>abstract<br>---<br>-/-- | 1-5,<br>11-14 |

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 5 February 2001 | 12/02/2001 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Pantoja Conde, A |

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Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication,where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | PATENT ABSTRACTS OF JAPAN<br>vol. 005, no. 064 (P-059),<br>30 April 1981 (1981-04-30)<br>& JP 56 016111 A (HITACHI LTD),<br>16 February 1981 (1981-02-16)<br>abstract | 1,34 |
| A | DE 41 37 175 A (LANG MANUEL)<br>5 November 1992 (1992-11-05)<br>column 2, line 55 - line 68<br>column 3, line 1 - line 19; figure 1 | 1-5,16,<br>34 |
| A | PATENT ABSTRACTS OF JAPAN<br>vol. 1996, no. 01,<br>31 January 1996 (1996-01-31)<br>& JP 07 239652 A (MITSUBISHI PENCIL CO<br>LTD), 12 September 1995 (1995-09-12)<br>cited in the application<br>abstract | 1,16-18,<br>34 |
| A | PATENT ABSTRACTS OF JAPAN<br>vol. 1995, no. 11,<br>26 December 1995 (1995-12-26)<br>& JP 07 219426 A (MITSUBISHI PENCIL CO<br>LTD), 18 August 1995 (1995-08-18)<br>abstract | 1,8-10,<br>34 |

2

# INTERNATIONAL SEARCH REPORT

[redacted]tion on patent family members

International Application No
[redacted]T/US 00/26394

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| JP 02214886 A | 27-08-1990 | NONE | |
| JP 10171383 A | 26-06-1998 | NONE | |
| JP 56016111 A | 16-02-1981 | NONE | |
| DE 4137175 A | 05-11-1992 | DE 9105345 U | 29-08-1991 |
| JP 07239652 A | 12-09-1995 | NONE | |
| JP 07219426 A | 18-08-1995 | NONE | |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 00/26394

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| JP 02214886 A | 27-08-1990 | NONE | |
| JP 10171383 A | 26-06-1998 | NONE | |
| JP 56016111 A | 16-02-1981 | NONE | |
| DE 4137175 A | 05-11-1992 | DE 9105345 U | 29-08-1991 |
| JP 07239652 A | 12-09-1995 | NONE | |
| JP 07219426 A | 18-08-1995 | NONE | |

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
26 April 2001 (26.04.2001)

PCT

(10) International Publication Number
WO 01/29803 A1

(51) International Patent Classification[7]: G09B 27/08, G09F 19/02

(21) International Application Number: PCT/US00/26394

(22) International Filing Date: 26 September 2000 (26.09.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/160,142 18 October 1999 (18.10.1999) US

(71) Applicant and
(72) Inventor: FRENCH, William, W. [US/US]; 2486 Montgomery Street, Cardiff, CA 92007 (US).

(74) Agent: BUCHACA, John, D.; Suite 150, 1545 Hotel Circle South, San Diego, CA 92108-3412 (US).

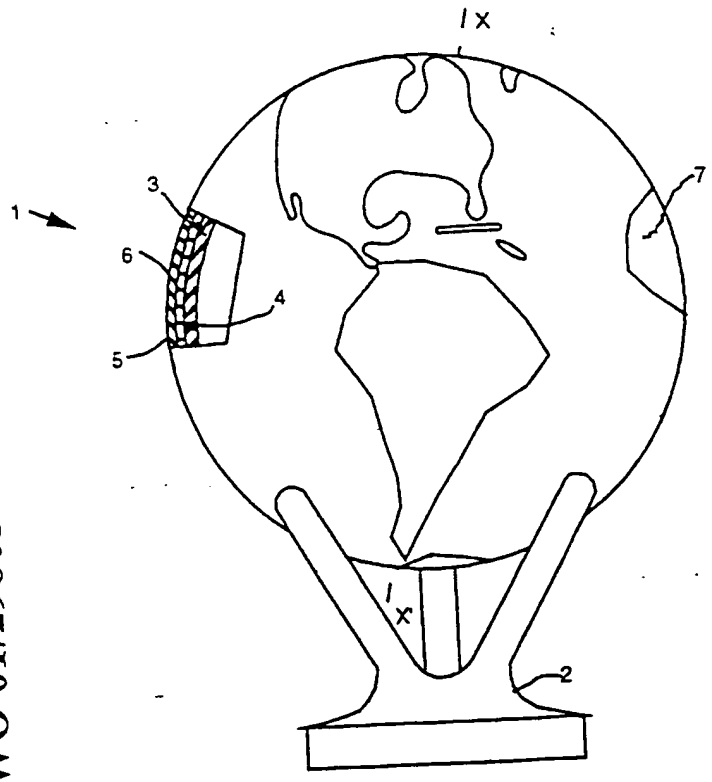
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**
— *With international search report.*
— *Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: SELF ROTATING DISPLAY SPHERICAL DEVICE




(57) Abstract: An intriguing and educational display structure (1) appears to be spinning upon itself without any apparent drive mechanism, power supply or bearing. The structure comprises two concentric hollow spheres (3, 5) spaced apart by a transparent fluid (6). The outer sphere is totally transparent, immobile and may rest on a tripod (2) or other type of support. The inner sphere may be partially transparent or translucent and carries over its surface, a design such as a map of the world (7). The inner sphere rotates within, and independently from the first outer one. The internal, that is self-contained drive mechanism is referenced to either a compass, a light angle detector, or a gravity sensor, and uses either a conventional electrical motor with its own internal field winding and communitator, or one made of a rotor comprising a cross-array of electromagnets (AC, BD) that interact with the earth magnetic field.

WO 01/29803 A1

# SUPPORTLESS SELF-POWERED MOVING DISPLAY

## Field of the Invention

The instant invention relates to self-starting and self-powered display devices, and more particularly, to self-spinning globes powered by radiated energy.

## Background of the Invention

Various types of novelty structures which move with either no apparent support, drive mechanism, or power input are often used as toys, decorative conversation pieces or advertising media. Various embodiments of such structures have been disclosed in U.S. Patent No. 5,435,086 Huang et al., Japanese Patents Nos. 10137451, 101431101, and 10171383, all by Hirose Mamoru, Japanese Patents Nos. 7210081, 7219426, and 7239652 all to Taragi Hiroshi and German Patents Nos. DE19706736 Fushoellier, DE3725723 Steinbrinck, and DE 41377175 Lang. Most prior embodiments are not totally free of external connection. If they are not firmly anchored to an outer support, they require complex and bulky countertorque-producing mechanisms such as fan blades or other internal heavy and complex systems that consume a great deal of electrical power.

The countertorque-producing mechanisms and their supports are very evident to an observer, and do not create any interest or appreciation of ambient energy

fields.

The present invention results from an attempt to devise and intriguing and educational moving structure that requires a very low level of power derived from an ambient field of electro-magnetic radiation.

**Summary of the Invention**

The principal and secondary objects of this invention are to provide the simplest and least power-demanding rotating but yet stationary structure that can operate for extremely long periods of time without any apparent driving mechanism, input of power, or support bearing, and that may be suitable for use as a toy, advertising medium, novelty, or robotic component of a remote space or underwater installation.

In the preferred embodiment of the invention, these and other valuable objects are achieved by floating a sealed and hollow enclosure made of a transparent or translucent material within a volume of fluid held within a transparent sealed container of the same shape as the enclosure and mounted concentically around it. The outer container is suspended or otherwise supported by a tripod or other like structure. The internal enclosure carries, over its surface, a design such as a map of the world, and is made to spin upon itself independently from the outer container. Due to the transparency of the container and fluid, these components are not seen by the naked eye

focused on the design covering the surface of the inner enclosure. Accordingly, the design appears to be spinning without any bearing contact with the external support structure. The internal drive mechanism is anchored, in other words, derives its spinning countertorque from a weight which orients itself in response to gravity. The drive mechanism can be a conventional motor with its own armature, field magnet and commutator, or can be constituted by a circular array of electromagnets acting as a rotor as they are selectively enabled by an electronic or mechanical commutator in co-reaction with, or biased by, either the earth's magnetic field, another man-made magnetic field, the direction of ambient light or gravity. Power for the motor or electromagnets is obtained by collecting either light waves that impinge upon the enclosure throught the use of photovoltaic cells, or by receiving and rectifying radio-frequency waves from a remote transmitter.

Various commutating mechanisms for selectively and sequentially enabling the electromagnets are disclosed including an optical shutter that masks specific photo cells dedicated to particular electromagnets, an electronic electical impulse distributor and one responsive to tilt switches.

The preferred embodiment of the invention will be perceived as a replica of the planet earth floating in space and spinning forever in a stately way, autonomous,

and guided by the interplay of solar energy, gravity and geomagnetic forces; a true icon for of a sustainable energy future for the earth.

The fluid supporting the enclosure may be a liquid or a gas, including air. The volume of fluid can be a large body of water or the atmosphere without need of a container. For example, filled with helium, the enclosure will spin while stationarily floating above ground.

All embodiments are intended to be stationary, that is they are devoid of any moving mechanism that could cause a substantial change of location during their operations.

In embodiments of the drive mechanism where a man-made external energy field whether photic or magnetic is used, rotation of the field may provide the spinning force applied to the enclosure.

The drive mechanism is self-contained, that is, housed within the container, if not the enclosure.

## Brief Description of the Drawing

**Figure 1** is a front elevational view of the preferred embodiment of the invention;

**Figure 2** is a cross-sectional view of the enclosure exposing the internal drive mechanism;

**Figure 3** is a perspective view of a first alternate embodiment of the drive mechanism;

**Figure 4** is a cross-sectional view of a second

alternate embodiment of the drive mechanism;

**Figure 5** is a top plan view thereof;

**Figure 6** is a diagram of the electromagnet feeding current circuit;

**Figure 7** is a cross-sectional diagram of a third alternate embodiment of the drive mechanism;

**Figure 8** is a top plan view thereof;

**Figure 9** is a cross-sectional diagram of a fourth alternate embodiment of the drive mechanism;

**Figure 10** is a top plan view thereof;

**Figures 11 and 13** are partial, cross-sectional diagrammatic views of alternate locations of the drive mechanism;

**Figure 14** is a top, diagrammatical view of a single electromagnet version of the drive mechanism;

**Figure 15** is an electrical diagram of the directional bearing locator therefor; and

**Figure 16** is a cross-sectional diagrammatical view of a cylindrical embodiment of the invention.

## Description of the Preferred Embodiment of the Invention

Referring now to the drawing, there is shown in Figures 1 and 2 the first embodiment of the invention in the form of a globe **1** which rests on a three-pronged support **2**. The globe comprises a spherical, closed and sealed enclosure **3** made of two hemispheric shells of acrylic glued together along an equatorial seam **4**. The

enclosure 3 is concentrically surrounded by a spherical container 5 preferably made of transparent acrylic in the same manner as the enclosure 3. The enclosure 3 and the container 5 are separated by a small space filled with a liquid 6 so that the enclosure 3 is supported and surrounded by the liquid 6, and can spin upon itself about an axis **X-X'** independently of the container 5. Painted or etched upon the outer surface of the enclosure 3 is a graphic design, in this case, a map of the world 7. The weight of the enclosure is appropriately distributed to place the structure in the desired orientation.

The enclosure 3 is preferably translucent. In other words, it is permeable to light waves but can conceal the drive mechanism inside it so that it becomes invisible to a casual observer. The liquid 6 is also transparent and preferably comprises two immiscible fluids such a fluoro-carbon PFPE 5060 available from the 3-M Company of Minneapolis, Minnesota and a hydrocarabon fluid, NORPAR 12, available from the EXXON Company of Houston, Texas in a density ratio of 1.68 to 0.75 respectively. The higher density fluro-carbon fluid will normally occupy the lowermost part of the space between the enclosure and the container, and stabilize the floating structure. Any distortion caused by the different indexes of refraction of the fluids is least likely to be noticed in that region of the display. The fluids have been selected by reason of their

immiscisbility, their low wetability, noncorrosivity, relative densities and coefficient of thermal expansion in relation to that of the acrylic material used in the fabrication of the two spheres. With this combination of liquids and the concentric arrangement of the sphere, any material expansion or constriction due to changes in temperature does not cause any risk of deformation or breakage.

Graphic features on the inner or outer surface of the enclosure 3 will appear to be on the outer surface of the container 5 with the proper choices of indexes of refraction and dimensions, according to well-known principles of optical refraction. This illusion works best if the container is free of visible features, but it can have a uniform tint that does not give a viewer a clue that it is not rotating. Alternatively, graphic features can be printed on the container, or objects can be floated within the fluid to create other amusing optical effects.

As shown in Figure 2, the internal drive mechanism comprises an electrical motor 8 whose stator and housing are fixedly held by a tubular casing 9 also fixedly secured to the inside wall of the enclosure 3. A shaft 10 projecting from the rotor of the motor is supported at its distal end by a pin bearing 11 on the antipodal part of the enclosure inside wall surface. A body mass or weight 12 is fixedly attached to the shaft with its center of gravity C held distally from it. The weight responding to

the gravity G of the earth causes the shaft or axle 10 and the axis of rotation X-X' to tilt slightly in order to place the weight in its lowermost possible elevation. The weight 12 acting as a gravity sensor, tends to oppose the rotation of the shaft. Indeed, any rotation of the shaft about axis X-X' would result in an elevation of the center of gravity C against the pull of the earth's gravity. Accordingly, while the axle 10 is in the illustrated position, the powering of the motor 8 will cause the rotation of the stator and the entire enclosure and drive mechanism save for the axle immobilized by the weight 12 acting as a directional bearing locator, anchor and countertorque element. The weight can advantageously be magnetized so that it will align itself with the earth magnetic field and further stabilize the structure. In which case, the center of gravity G needs not be offset.

A multi-element photovoltaic collector 13 is mounted on the upper surface of an equatorial septum 14 fixedly connected to the enclosure 3. Light rays or waves L passing through the transparent container and liquid, and the translucent wall of the enclosure 3 impinge upon the collector 13. The resulting electrical current is fed to the motor 8 through a pair of conductors 15. Accordingly, to the naked eye, the structure appears like a sphere spinning upon itself without any apparent supply of power, drive mechanism, or support bearings. It should be noted that the structure can be activated by solar

light or any kind of man-made illumination.

The first alternate embodiment **16** of the drive mechanism illustrated in Figure 3, relies on a known relationship between the orientation of an ambient magnetic field and the direction of another ambient field of energy such as another magnetic field, a field of radio waves or, as more specifically taught in this embodiment, a field of light waves impinging upon the enclosure. The enclosure spinning torque is derived from the earth magnetic field **M** and the directional bearing locator function is achieved by sensing the direction of the light waves **L**. The electrical motor is constituted by two electromagnets **AC and BD** positioned on the equatorial septum **14** in a cross-array wherein each electromagnet is oriented radially from the axis of rotation **X-X'**. Four photosensors **a, b, and d** are mounted in a pyramidal configuration wherein the photo-sensitive surface of each sensor lies in a different plane than the plane in which the photo-sensitive surface of any one of the other sensors lies. The angle **17** of the planes in relation to the spinning axis, can vary from zero degrees to approximately 75 degrees. Each plane is generally oriented in the same radial direction as one of the electromagnets. A series of photovoltaic collectors **13** are positioned on the septum **14** so that their photosensitive surfaces are substantially perpendicular to the axis of rotation **X-X'**. These collectors are wired

together to repeatedly and sequentially enable the motor by providing a feeding and polarizing current to the electromagnets as determined by a logic unit **19** mounted under the photosensors **a, b, c, and d.**

Each of the electromagnets is preferably constituted by low coersivity iron core rod and a wire bobbin **A and C** or **B and D** at either end.

Assuming that each control photosensor is generally pointing to the same radial direction as an electromagnet bobbin of same reference, the logic unit **19** performs the following function:

If $C_a$ is the greatest, then enable BD.

If $C_b$ is greatest, then enable AC.

If $C_c$ is greatest, then enable DB.

If $C_d$ is greatest, then enable CA.

Wherein $C_a$, $C_b$, $C_c$ and $C_d$ represents the current flowing out of the **a, b, c, and d** control photosensors respectively, and **BD** indicates that the **BD** electromagnet is so polarized as to have its North Pole on the **B** boggin side, **DB** indicates that the **BD** electromagnet has its North Pole on the **D** bobbin side, and **AC and CA** similarly indicate the polarization of the **AC** electromagnet. This logic can be readily implemented with a gating array or by means of a microprocessor. The phase relationship between the electromagnets and the photosensors can be modified and adjusted for optimal performance.

Instead of comparing the current outputs of the

respective photosensors, the logic unit **19** may be designed to respond only to a current output exceeding a preset threshold level indicative of a substantial orthogonal orientation of the sensor in relation to the direction of the magnetic field.

In a variation of the above-described drive mechanism, the control photosensors **a, b, c, and d** are selected to be of photovoltaic type, large and powerful enough to provide the feeding current to the electromagnets in the absence of the horizontally mounted photovoltaic collectors **13**. It should be noted that all of the bobbins will be energized all the time to some degree and that bobbins on opposite ends of a given magnet will tend to magnetize the rod in opposite directions. The net magnetization of a given rod will depend on which bobbin is receiving the greatest current, which depends on which of the two driving photocollectors is receiving the most light. The angular relationship between the photocollector array and the electromagnets can be set to respond to a given magnetic field direction and ambient light direction, to drive rotation essentially the same as was described in Figure 3.

The electromechanical device can consist of a single electromagnet and a single photosensor. In such a case, the spinning movement of the enclosure may have to be manually initiated.

In the second alternate embodiment **20** of the drive

mechanism illustrated in Figures 4-6, the directional bearing locator is constituted by a magnet **21** that acts like a compass and orients itself with the earth magnetic field **M** to position and immobilizes the freely rotating axle **22** not unlike the axle **10** in the first embodiment of the driving mechanism. The axle passes through the center of the equatorial septum **14**, and mounts at its top a circular shutter **23** having a radial sector **24** of approximately 90 degrees cut out of it. Mounted on the top surface of the septum **14**, and under the shutter **23**, is a cross-array of photosensors or photovoltaic sensor-collectors **a, b, c and d**. A second septum **14A** parallel to the first is positioned above the shutter, has an aperture above each photosensor, and acts as a diaphragm. As the whole enclosure **3** and septi **14, 14A** rotate about the central vertical axis **X-X'**, the photosensors are sequentially and periodically exposed, one at a time, to light waves **L** passing through the transparent or translucent wall of the enclosure. The larger photovoltaic collector **13** mounted on the top surface of the upper septum **14A**, has a photo sensitive top surface also exposed to the light waves. The cross-array of electromagnets **AC** and **BD** of the previously described embodiments extends to the periphery of the septum **14** which each electromagnet bobbin set at a predetermined angle from one of the photosensors **a, b, c or d**. When energized, each of the electromagnets tends to orient

itself with the earth magnetic field just like the magnet **21** and shutter **23**.

The ambient magnetic field along which the electromagnets seek to align themselves, may be the geomagnetic field or the field created by the locator magnet **21** if the latter is powerful enough to supplant the earth magnetic field.

As illustrated in Figure 6, the control current flowing out of the photosensors **a,b,c, and d** exposed to the light waves is used to open an electronic matrix **25** of MOSFET switches **T1-T8** which distributes the feeding current out of the large photovoltaic sensor **13** to the appropriate electromagnet with the required polarization. When an electromagnet is energized, it seeks to align itself with the ambient magnetic field and cause the entire enclosure to spin counter-clockwise when looked at from the top.

Reed switches, optical and solid state sensors such as Hall-effect sensors can be used to accomplish the commutating functions.

Reflectively mounted mirrors can be disposed on the shutter to increase the amount of light impinging upon the exposed sensor.

In lieu of, or in addition to, the large photovoltaic sensor **13**, a radio frequency antenna **26** coupled to a receiver and rectifier unit **27** mounted against the under-surface of the septum **14** can be used to

generate a feeding electrical current to the electromagnets. The radio frequency waves **R** can be generated by a remote transmitter not shown on the drawing.

It should be understood that when photovoltaic sensor-collectors are used to generate the energizing current fed to the electromagnets, there is no need for the electronic switching matrix **25**.

In the third alternate embodiment **28** of the drive mechanism illustrated in Figures 7 and 8, the directional bearing locator is constituted by a sensor **12** similar to the one of the first embodiment causing the enclosure **3** to spin about an axis **X-X'** which is slightly oblique to the vertical. The cross-array of electromagnets **AC** and **BD** mounted on the equatorial septum **14** is essentially the same as the one in the previously described embodiment **20**. However, the control elements are constituted by four mercury tilt switches **a, b, c and d**. The tilt switches are wired to distribute the feeding current out of the photovoltaic collector **13** to the electromagnet of like designation. However, tilt switches **a and c** are aligned with electromagnet **BD**, and tilt switches **b and d** are aligned with electromagnet **AC**. When energized, each of those electromagnets tend to align with the ambient magnetic field, such as the one created by an external magnet **29** mounted distally on the bottom.

In a fourth alternate embodiment **30** of the drive

mechanism illustrated in Figures 9 and 10, the magnet **21** acts as the directional bearing locator and the photovoltaic collector **13**, and is rotatively mounted on a central axle **10**. The axle, as well as the equatorial septum **14**, are fixedly attached to the enclosure **3**. A set of four ring segments **a, b, c and d** are mounted proximate the top surface of the axle in a cross-array configuration. As the enclosure spins about axis **X-X'** which is coincident with the axle **10**, a pair of brushes **18** are used to enable the cross-array of electromagnets **A, B, C and D** in a similar manner as was disclosed in connection with the previously described embodiments. The sequential and alternate distribution of the feeding current to the electromagnets including their polarity commutation are accomplished according the techniques well known to those with ordinary skill in the art.

It should be understood that the directional bearing locator of the first embodiment of the drive mechanism could be used in connection with the second described embodiment and vice versa, and that the antenna and radio frequency wave receiver could be used in connection with any of the embodiments of the mechanical drive.

The below-described improvements to the various drive mechanisms are not essential to the operation of the preferred embodiment, yet they can advantageously enhance its performances.

In order to cancel any possible effect of the magnetic field generated by the electromagnets **AC** and **BD** upon the magnetic directional bearing locator used in some of the previously described versions of the drive mechanisms, a set of four bucking coils **ac, bd, ca, and db** can be mounted around the compass magnet **21** as illustrated in Figures 4 and 5. It should be noted that the four bucking coils and the electromagnets are normally fixedly connected to the enclosure **3**. Bucking coils **bd and db** are aligned with electromagnet **BD**, and bucking coil **ac** and **ca** are aligned with electromagnet **AC**.

The circuit illustrated in Figure 6, is used to control the flow of polarizing current through both the electromagnets and the bucking coils. The object is to create through the bucking coils, a magnetic field which is, in the vicinity of the compass magnet **21**, substantially equal and opposite to the one concurrently being generated by the corresponding electromagnet by appropriately turning on the transistor switches **T1-T8**. Is should be noted that, depending upon the type and position of the sensors **a, b, c and d**, the wiring connections of the various bobbins and coils has to be appropriately switched. In some cases two single orthogonally disposed bucking coils rather than pairs of them may suffice.

The directional bearing locator and drive mechanism need not always be mounted inside the enclosure

3. As illustrated in Figures 11-13, those two elements are immersed in the fluid 6, and fitted into a cylindrical cavity 31 at the South pole of the enclosure 3. In Figure 11, the drive mechanism consists of the electrical motor 8 fixedly attached to the enclosure, and having its rotor and axle 10 fixedly attached to the directional bearing locator. The latter consists of a magnet 21 buried into a pivot-acting puck 32 having an undersurface 33 spherically contoured to closely match the bottom section 34 of the container. A thin film of fluid between the two surfaces allows for the proper alignment of the magnet with the geomagnetic field. A non-magnetized puck may be used. The puck, in response to gravity or the ambient field of intermolecular forces, creates enough friction or shear forces in the film of fluid or static friction against the bottom surface of the container to provide the counter-torque necessary to the motor to spin the enclosure. The bottom of the puck may also be kept distally from the container as shown in Figure 12.

In the embodiment of the drive mechanism shown in Figure 13, while the directional bearing locator is outside the enclosure, the motor is within. Coupling between the motor axle and the puck 35 is provided across the enclosure wall by means of matching magnets 36, 37, one attached to the axle, the other to the puck. Appropriate bearings may be used between the puck and the enclosure, and the respective locations of the motor and

puck may be inverted. In which case, the feeding current may be derived from structures located without the enclosure.

Instead of a cross-array of electromagnets, a single electromagnet may suffice to drive a particularly light enclosure. As illustrated in Figures 14 and 15, a single sensor **38** mounted on a single electromagnet **AB** can be advantageously used to control the polarization of the bobbins **A and B**.

As more specifically shown in Figure 15, a bipolar voltage (V+, V-) is applied to plates **39, 40** sandwiching an elongated Hall-Effect sensing element **41**. The element is mounted horizontally on the electromagnet or its support axle. When the ambient magnetic field **M** is perpendicular to the element **41**, it generates a Hall Voltage between the plates **39, 40**.

If the direction of the magnetic field is reversed, the polarity of the Hall Voltage will be inverted. Thus, the Hall Voltage can be applied to the bobbins **A, B** through an amplifier **42** to control their directional polarization.

If the sensor element **38** is perpendicular to the electromagnet as shown in Figure 14, the latter will be energized only when it is out of alignment with the ambient magnetic field.

In embodiments of the drive mechanism such as the ones illustrated in Figure 7, it may be advantageous to

cause the enclosure to always tilt in the same direction in order to avoid wobbling and misalignment with an outer magnetic field generator. This can be accomplished by incorporating a long, axially oriented rod magnet into the axle **10** as illustrated in Figure 7. The bottom of the rod magnet interacts with the magnet **30** in the base section of the liquid **6** or container **5** to center the enclosure. The top of the rod magnet always tilts toward the same pole of the ambient magnetic field, and remains in that direction. Another way to stabilize the enclosure would be to put interfacing magnets or interlocking pin-and-cavity structures between the enclosure and container near the North and South Poles.

The design needs not necessarily be applied directly to the enclosure. A number of co-nested enclosures can be used separated by a number of transparent or tinted fluids to achieve a variety of informative or aesthetic renditions.

The container and enclosures may take a variety of shapes. Illustrated in Figure 16 is a set of nested cylindrical structures in which the outer one **43** acts like the container and the inner one **44** acts as the enclosure of the previously described embodiment. Both structures and the separating fluid **45** are light permeable. The outer structure **43** rest on a support **46**. The directional bearing locator is simply constituted by a shutter pattern **47** printed upon, or embedded into the central top portion

of the outer structure **43**. This pattern is essentially similar to the shape of the shutter illustrated in Figures 4 and 5, and must be manually oriented so that the center of the angular cutout approprietely controls the energizing of the electromagnets.

Photosensors **a, b, c, d** (the latter not shown on the cross-sectional view) are installed against or into the roof of the inner structure **44** in a cross-arrangement under the shutter pattern. The main photovoltaic collector **13** and electromagnet array **AB** and **CD** are essentially similar to those described in the embodiments of Figures 4 and 5.

While the preferred embodiments of the invention have been described, modifications can be made and other embodiments may be devised without departing from the spirit of the invention and the scope of the appended claims.

## CLAIMS

1. A self-powered, mobile, substantially stationary structure which comprises a spinning body substantially enclosing a self-contained drive mechanism powered by energy derived from electromagnetic radiations, and biased by the direction of an ambient field of energy.

2. The structure of Claim 1 which further comprises:

a volume of fluid;

an enclosure substantially buoyantly supported by said fluid;

a directional bearing locator associated with said enclosure and responsive to said ambient field of energy;

means for collecting energy from said electromagnetic radiation; and

wherein said drive mechanism comprises means for moving said enclosures in reference to said locator and in response to said means for collecting.

3. The structure of Claim 2 wherein said means for moving comprise an electro-mechanical device for rotating said enclosure about a first axis.

4. The structure of Claim 3 wherein:

said electromagnetic radiations comprise light waves; and

said means for collecting comprise a photovoltaic

collector generating an electrical current when exposed to said light waves.

5. The structure of Claim 4 wherein said electro-mechanical device comprises an electrical motor energized by said electrical current.

6. The structure of Claim 3 wherein:

said electromagnetic radiations comprise radio frequency waves; and

said means for collecting comprise an antenna and a radio frequency receiver generating an electrical current when said antenna is exposed to said radio frequency waves.

7. The structure of Claim 6, wherein said electro-mechanical device comprises an electrical motor powered by said electrical current.

8. The structure of Claim 3, wherein:

said ambient field of energy comprises the earth gravity; and

said locator comprises a gravity force sensor.

9. The structure of Claim 8, wherein said gravity force sensor comprise a weight mounted on an axle substantially aligned with said axis; and

further comprises a magnet substantially parallel to said axis.

10. The structure of Claim 3, wherein:

said ambient field of energy comprises the earth magnetic field; and

said locator comprises means for detecting said earth magnetic field.

11. The structure of Claim 3 which further comprises a container holding said fluid; and

said enclosure is held within said container and spaced apart thereof by said fluid.

12. The structure of Claim 11, wherein said enclosure and said container are closed and said fluid substantially surrounds said enclosure;

and wherein said enclosure and said container have similar shapes.

13. The structure of Claim 12 wherein said enclosure and said container consist of hollow spheres.

14. The structure of Claim 12, wherein:

said enclosure and said container are made of light-permeable material;

said electromagnetic radiation comprises light

waves;

said means for collecting comprise a photovoltaic collector, associated with said enclosure, generating an electrical current when exposed to said light waves.

15. The structure of Claim 12, wherein:

said electromagnetic radiations comprise radio frequency waves;

said means for collecting comprise an antenna and a radio frequency receiver generating an electrical current when said antenna is exposed to said radio frequency waves;

said electro-mechanical device is powered by said electrical current.

16. The structure of Claim 3, wherein said electro-mechanical device comprises:

a motor having a rotor and a stator, one of said rotor and stator being fixedly attached to said enclosure, and the other fixedly attached to said locator.

17. The structure of Claim 3, wherein said ambient field or energy comprises a magnetic field; and

said electro-mechanical device comprises:

at least one magnetic field sensor responsive to said magnetic field; and

means for repeatedly enabling said sensor.

18. The structure of Claim 17, wherein said electro-mechanical device further comprises an axle substantially aligned with said axis, and said magnetic field sensor is radially mounted around said axle.

19. The structure of Claim 18, wherein;

said sensor are rotatably connected to said axle and fixedly attached to said enclosure:

and said axle is fixedly attached to said locator.

20. The structure of Claim 17, wherein said locator comprises a magnetic field sensor.

21. The structure of Claim 17, wherein:

said sensor comprises an electromagnet which when enabled rotatably aligns itself with said magnetic field; and

said means for enabling comprise means for selectively applying a feeding current to said electromagnet.

22. The structure of Claim 21, wherein means for selectively enabling comprise a commutating mechanism connectively biased by said locator to enable said electromagnet when said electromagnet is not aligned with said magnetic field.

23. The structure of Claim 22, wherein:

said electromagnetic radiations further comprise light waves;

said means for collecting energy comprise a photovoltaic collector responsive to said light waves impinging upon said enclosure, and having an output connectable to said electromagnet; and

said commutating mechanism comprises a shutter associated with said locator , said shutter being shaped and dimensioned to selectively mask said photovoltaic collector when said electromagnet is aligned with said magnetic field.

24. The structure of Claim 22, wherein:

said electromagnetic radiations further comprise radio frequency waves;

said means for collecting comprise an antenna and a radio frequency receiver generating an electrical current when said antenna is exposed to said radio frequency waves; and

said commutating mechanism comprises an electrical impulse distributor responsive to the orientation of said locator in relation to each of said electromagnets to selectively apply said current to said electromagnet.

25. The structure of Claim 22, wherein said magnetic field comprises the earth magnetic field.

26. The structure of Claim 22 which further comprises at least one means positioned outside said enclosure to generate said magnetic field.

27. The structure of Claim 8, wherein said gravity force sensor comprises a weight rotatably connected to said enclosure , said weight having a center of gravity held distally from said axis.

28. The structure of Claim 3, wherein:

said electro-mechanical device comprises at least one electromagnet and a commutating mechanism;

said locator comprises a weight rotatably connected to said enclosure, said weight having a center of gravity held distally from said axis; and

said commutating mechanism comprises gravity switches responsive to the vertical orientation of said electromagnet.

29. The structure of Claim 21, wherein said means for selectively applying comprise a mechanism responsive to the relative orientation of said magnetic field and the direction of said ambient field of energy.

30. The structure of Claim 29, wherein:

said ambient field of energy comprising light waves impinging upon said enclosure; and

said mechanism comprises:

at least two photosensors for producing control currents for said electromagnet;

each of said sensors having a photo-sensitive surface, wherein the photo-sensitive surface of each of said sensors lies within a different plane than the plane of the photo-sensitive surface of any other sensor.

31. The structure of Claim 30 which further comprises:

at least one photovoltaic collector having a photo-sensitive surface, and producing said feeding current.

32. The structure of Claim 10, wherein said electro-mechanical device comprises at least one electromagnet generating a polarizing magnetic field; and

which further comprises at least one coil proximate said means for detecting, and at least one switch wired to energize said coil and create a corrective magnetic field opposite to said polarizing magnetic field.

33. The structure of Claim 17, wherein said means for repeatedly enabling said sensor comprises means mounted of said magnetic field sensor, for generating a voltage having a polarity responsive to the orientation of said sensor.

34. The structure of Claim 1 which further comprises a pivot supporting said structure above a surface.

**Supportless Self-Powered Moving Display**

**Abstract of the Disclosure**

An intriguing and educational display structure (1) appears to be spinning upon itself without any apparent drive mechanism, power supply or bearing. The structure comprises two concentric hollow spheres (3, 5) spaced apart by a transparent fluid (6). The outer sphere is totally transparent, immobile and may rest on a tripod (2) or other type of support. The inner sphere may be partially transparent or translucent and carries over its surface, a design such as a map of the world (7). The inner sphere rotates within, and independently from the first outer one. The internal, that is self-contained drive mechanism is referenced to either a compass (20), a light angle detector (19), or a gravity sensor (12), and uses either a conventional electrical motor (8) with its own internal field winding and communitator, or one made of a rotor comprising a cross-array of electromagnets (AC, BD) that interact with the earth magnetic field. The power supply comes from a photovoltaic collector (13) mounted within the inner sphere or from a receiver (27) of RF waves or other EM radiation.

2092PA.809

FIG 1

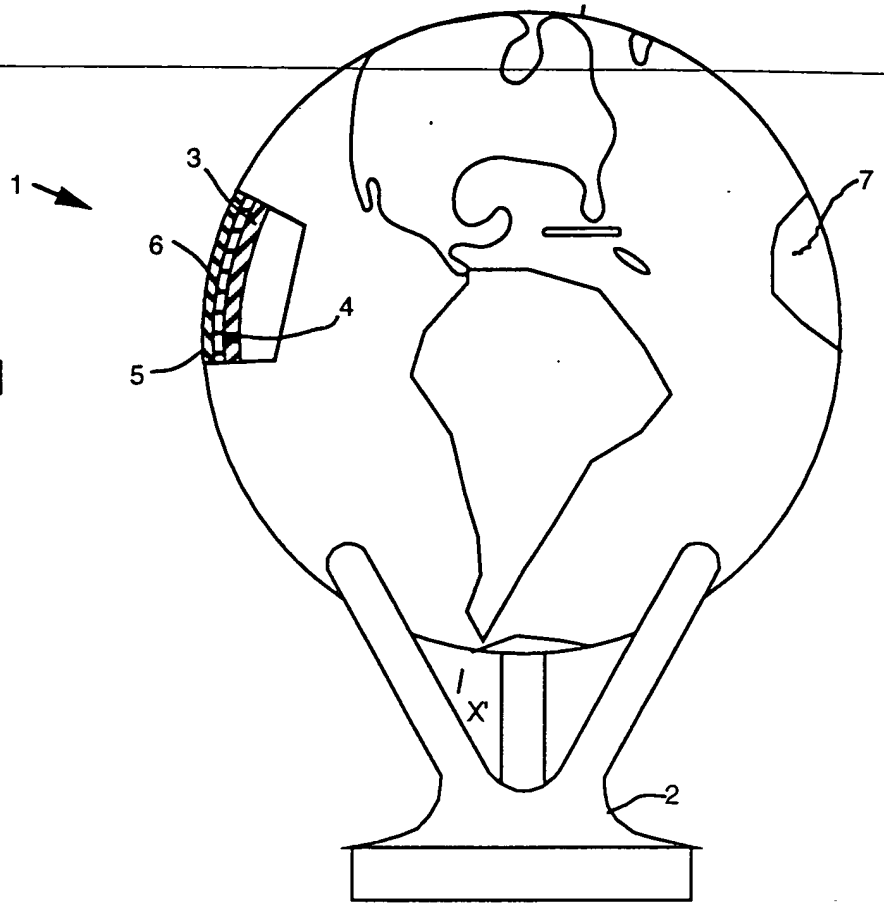



FIG 2

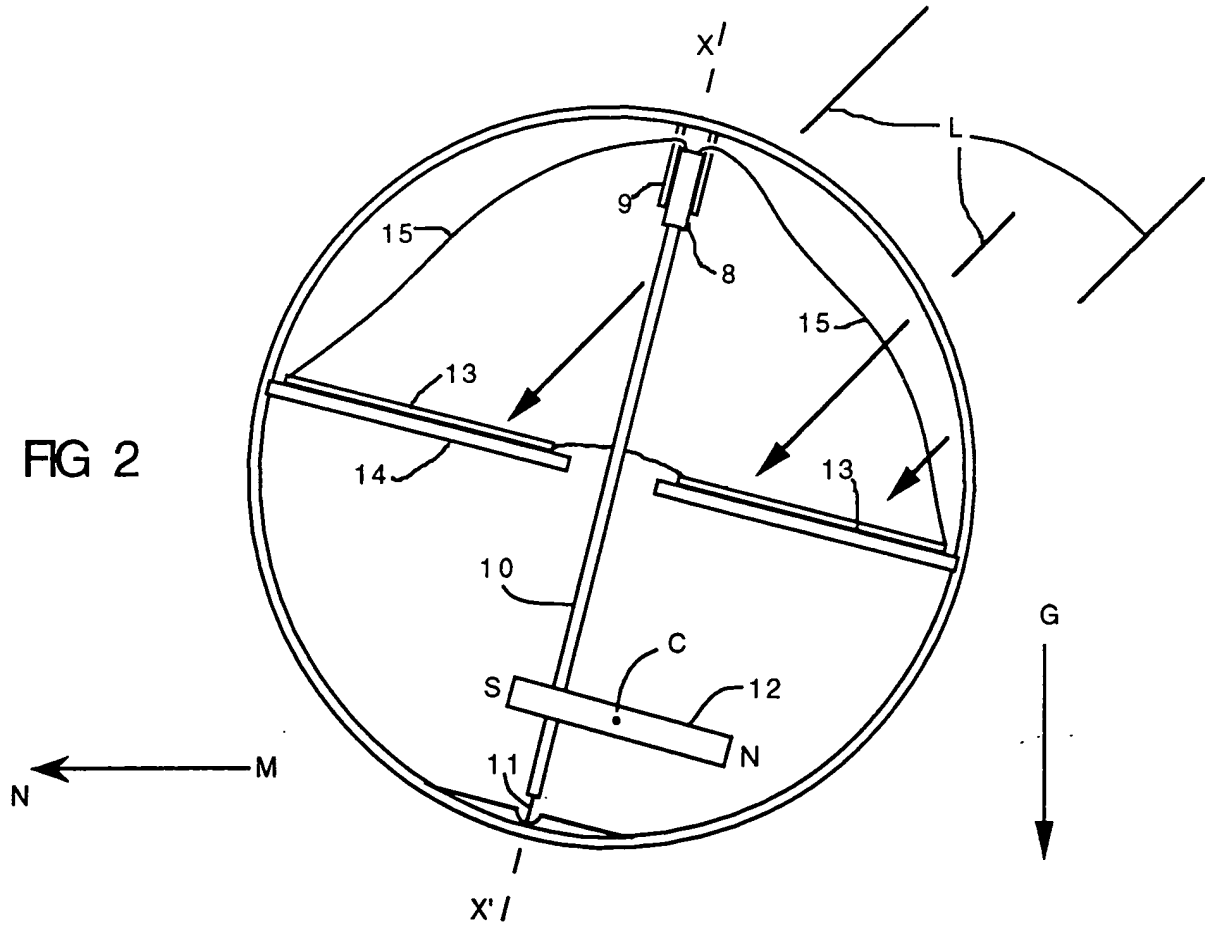


FIG 3

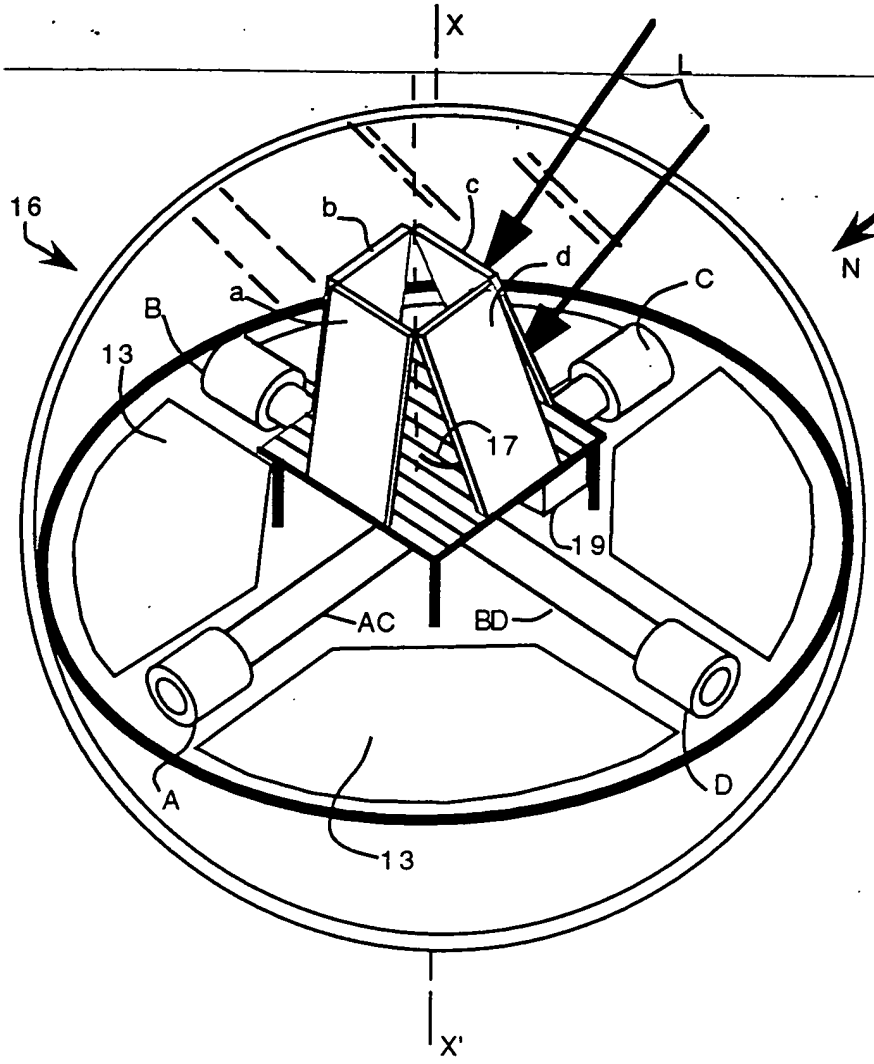

X
L
M
N
16
b
c
d
a
B
C
13
17
19
AC
BD
A
D
13
X'

FIG 6

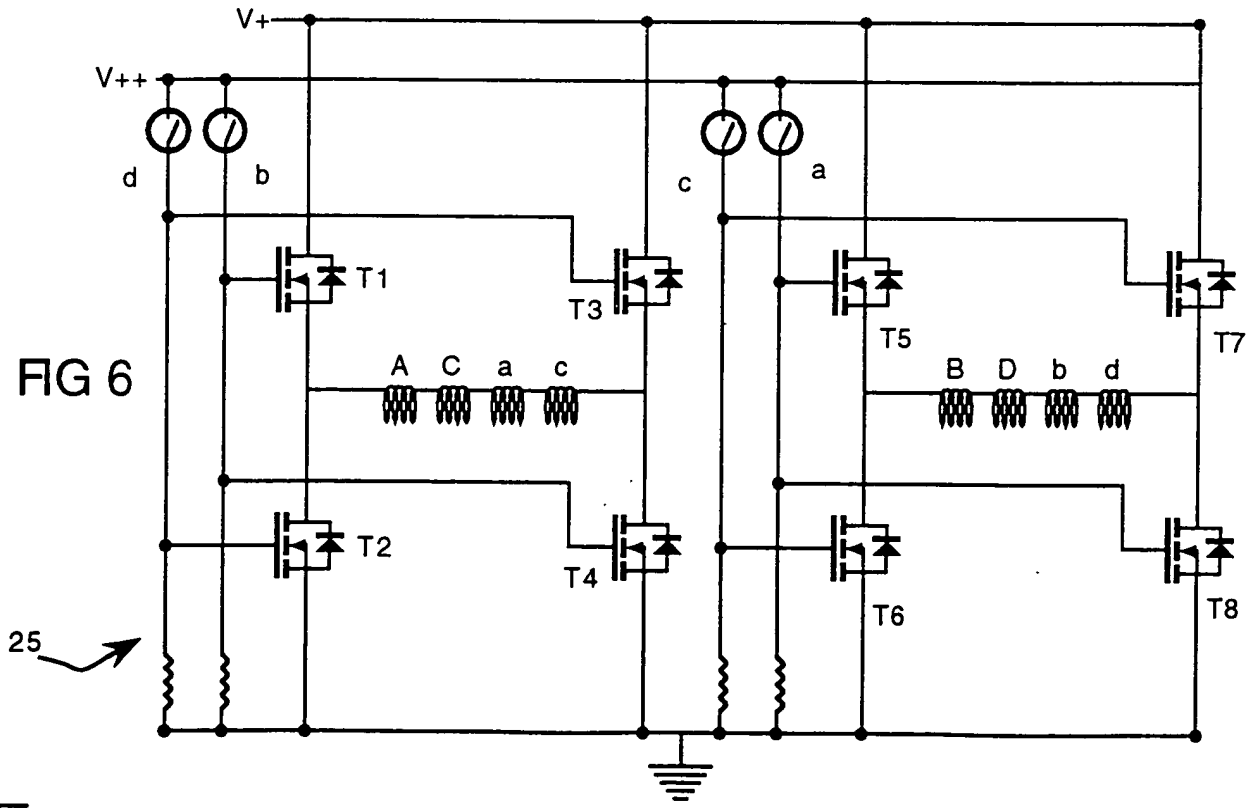

V+
V++
d
b
c
a
T1
T3
T5
T7
A C a c
B D b d
T2
T4
T6
T8
25

FIG 4

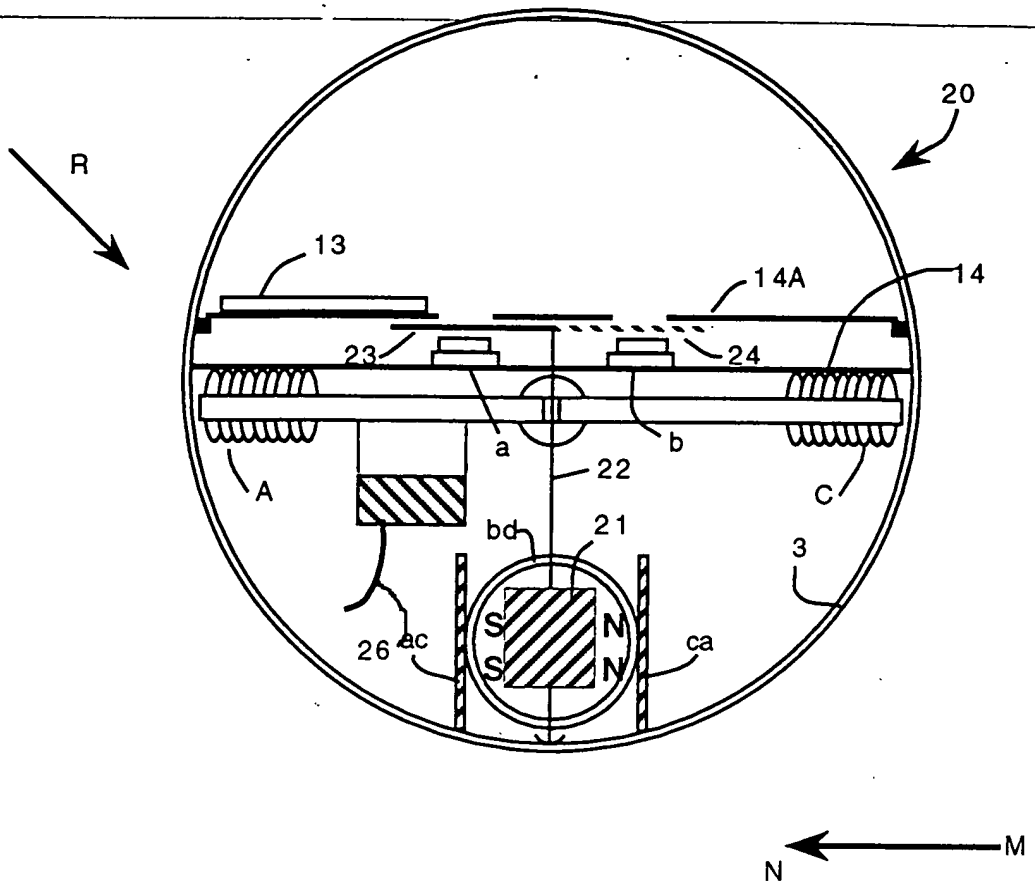

R
20
13
14A
14
23
24
a
b
22
A
C
bd
21
3
S
N
S
N
26
ac
ca
N
M

FIG 5

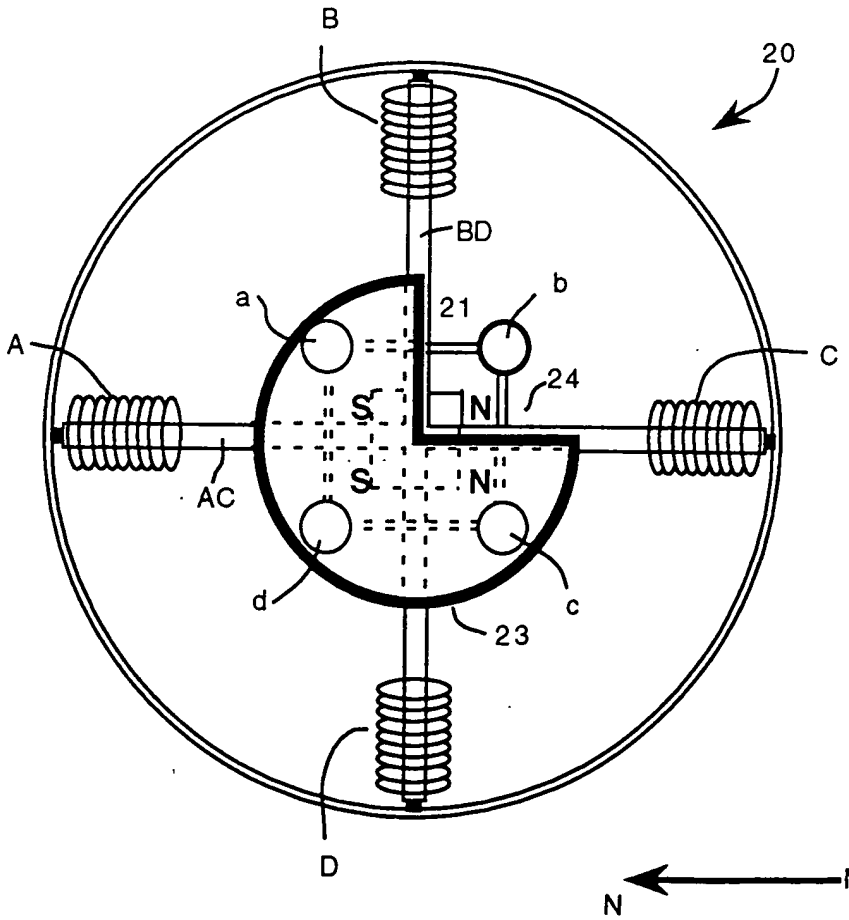

B
20
BD
a
b
21
A
C
24
S
N
S
N
AC
d
c
23
D
N
M

FIG 7

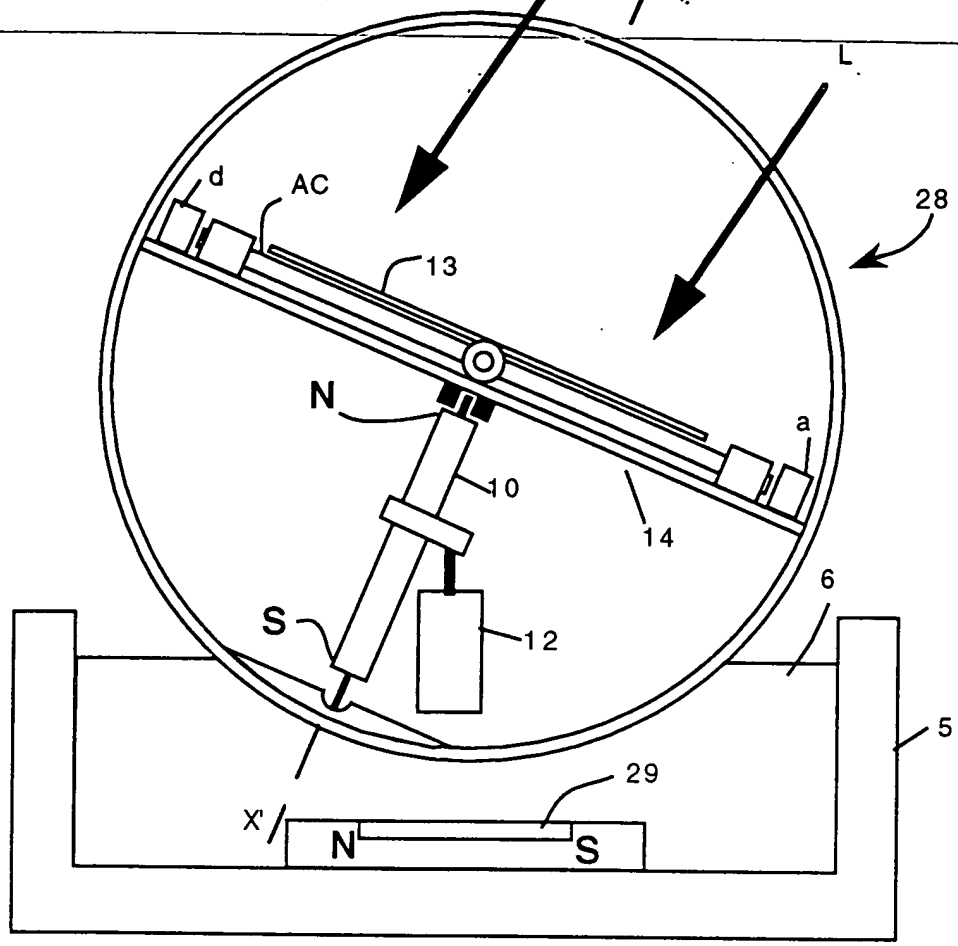
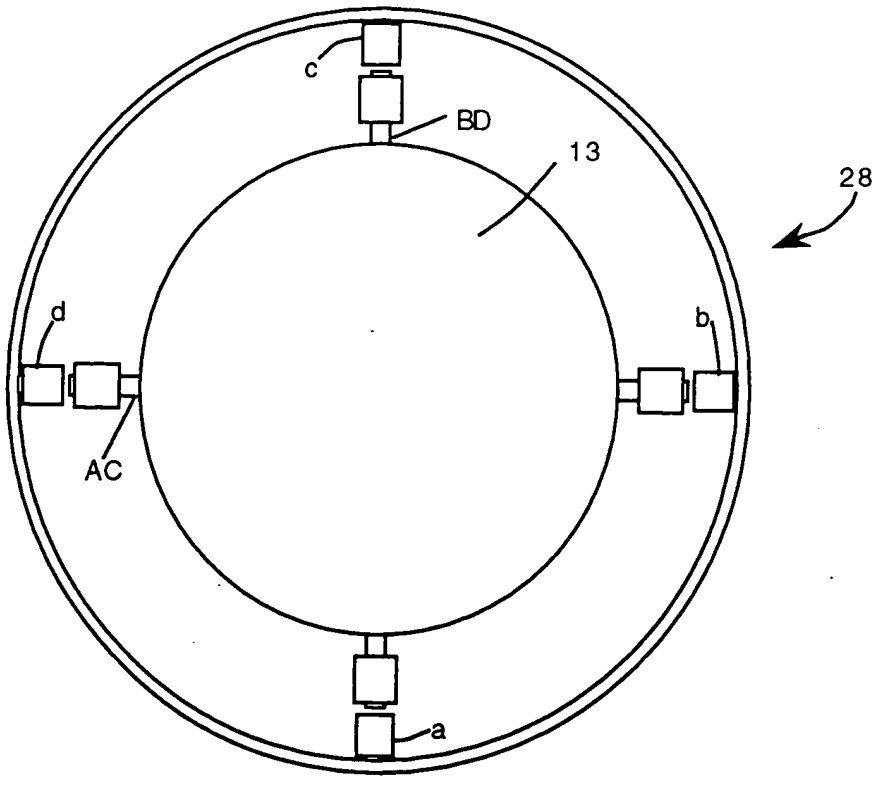



FIG 8



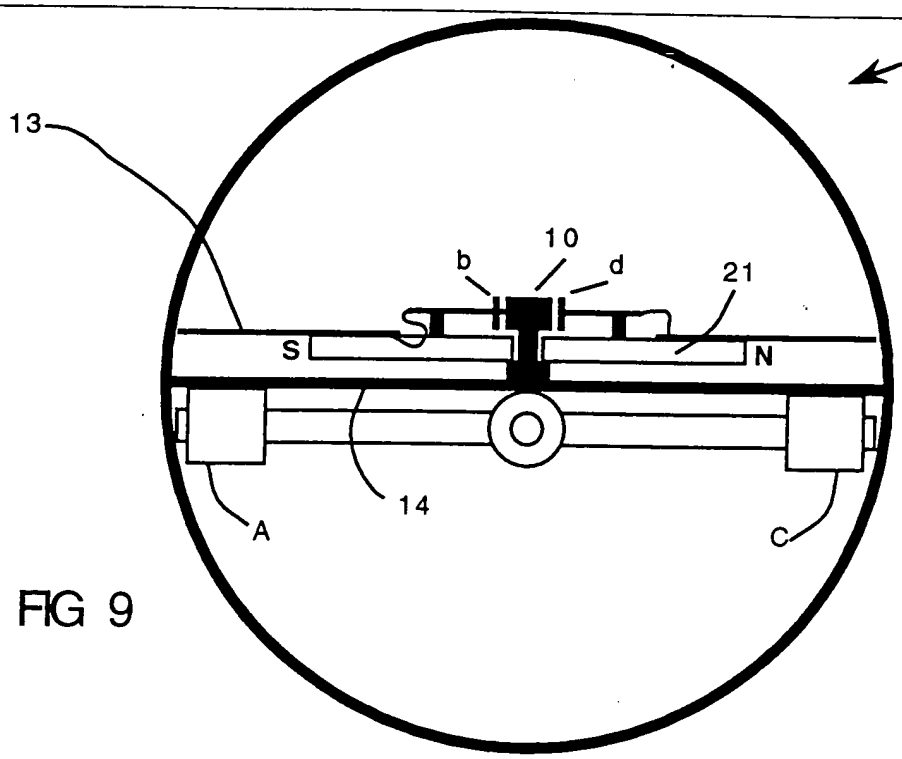
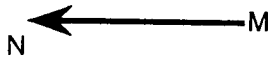



FIG 9



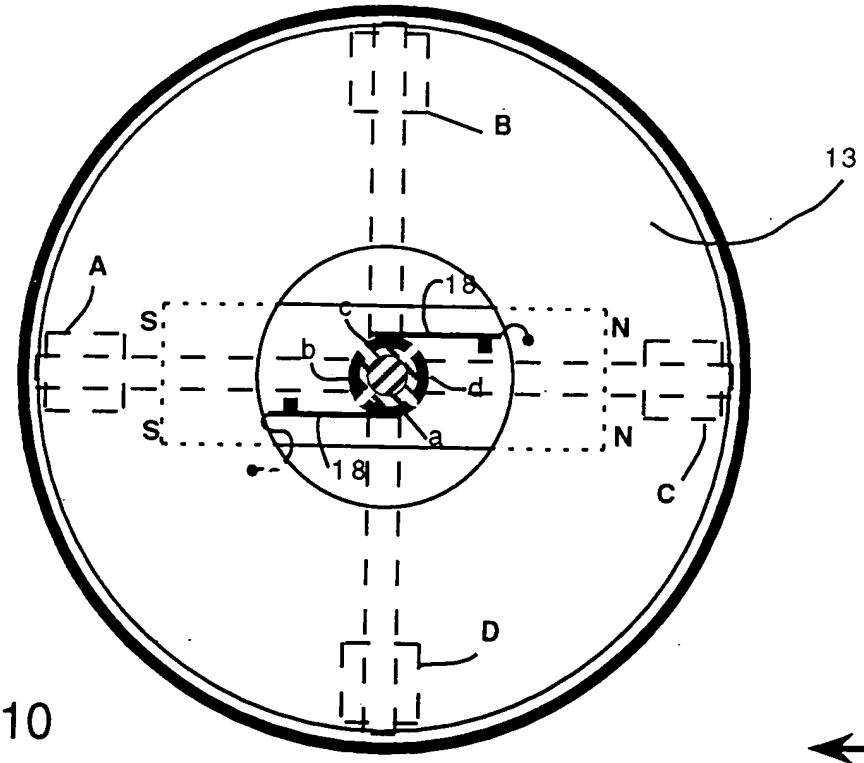




FIG 10

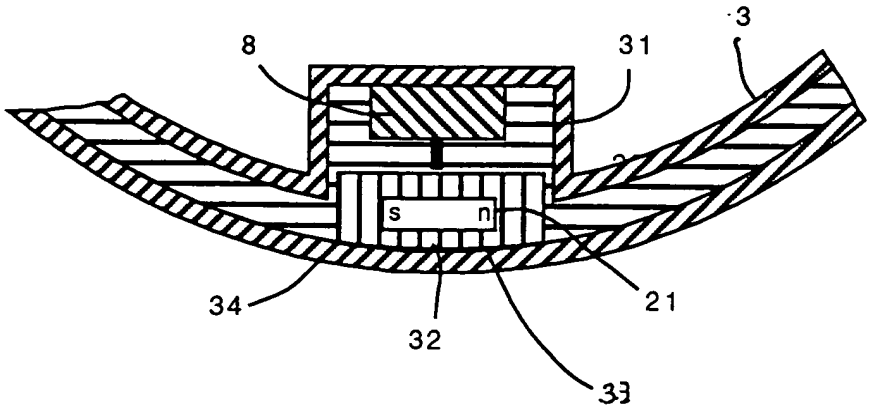



FIG 11

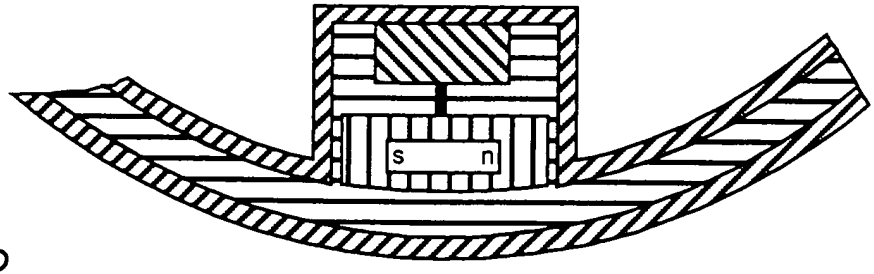



FIG 12

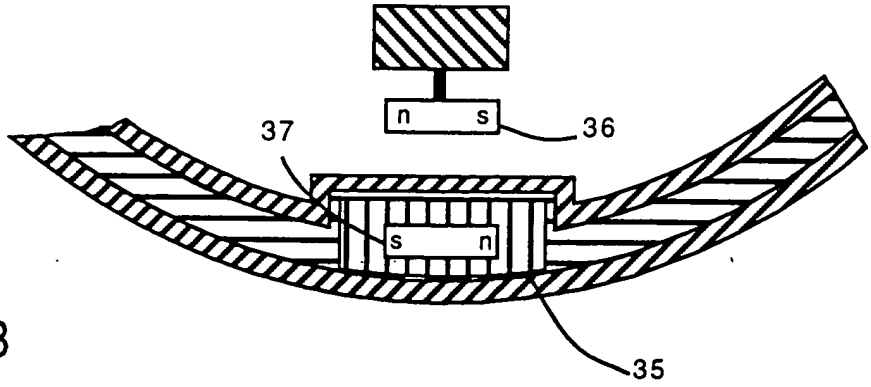
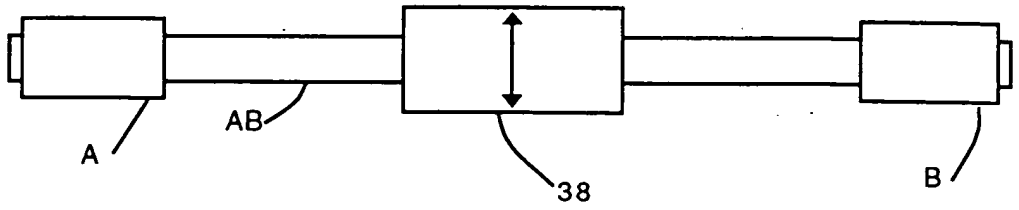



FIG 13

FIG 14



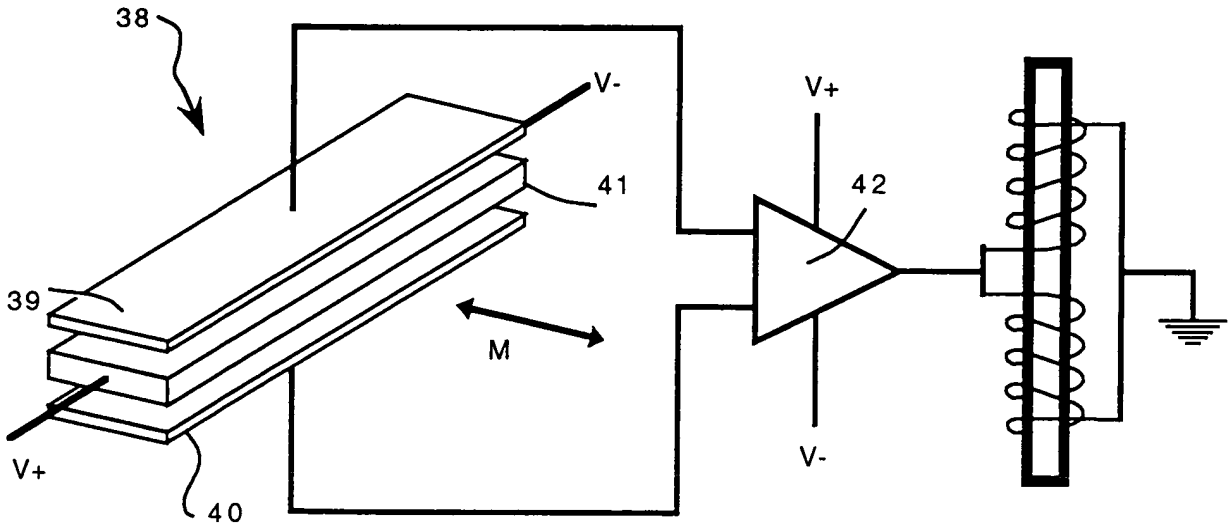




FIG 15

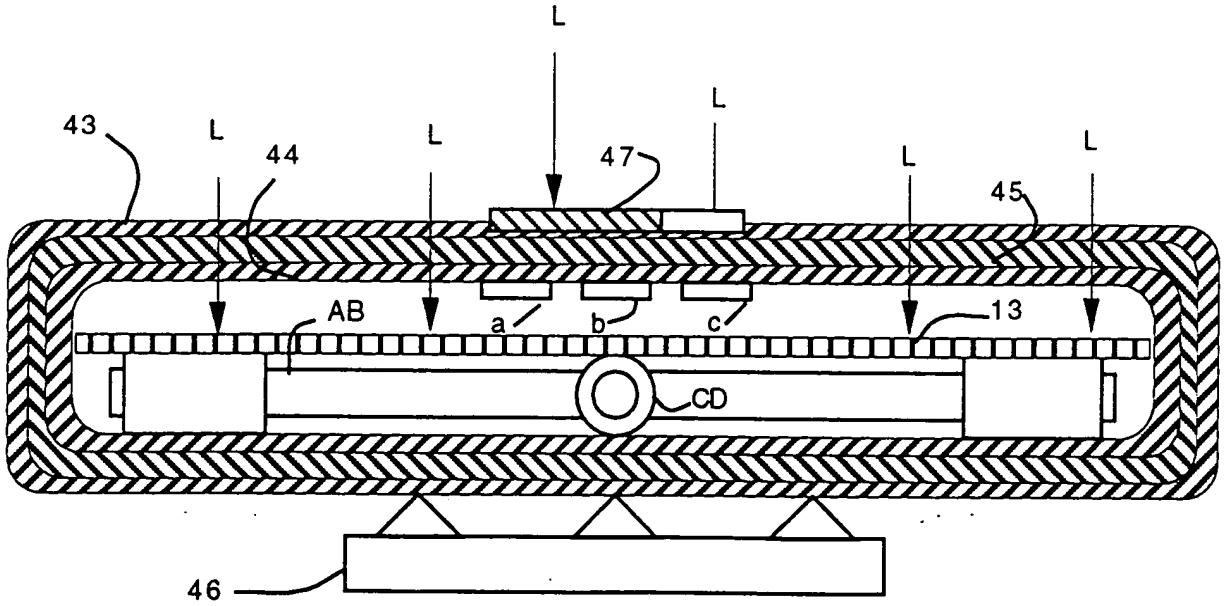



FIG 16